National Aeronautics and Space Administration

Technology Opportunity

Technology Transfer & Partnership Office

TOP3–00221

Propulsion Systems Laboratory

Facility

The Propulsion Systems Laboratory (PSL) is NASA's only ground-based test facility that provides true flight simulation for experimental research on air-breathing propulsion systems.

Facility Description

This continuous flow altitude simulation facility is equipped to conduct full-scale and component testing for base research, advanced aircraft, space transportation, general aviation propulsion, and hypersonic propulsion.

Unique concepts in altitude engine testing have been pioneered and perfected in the PSL, such as multi-axis thrust measurement, vectored and reverse exhaust gas collection, infrared imaging at altitude, aeroelastic measurements, transient pressure and/or temperature distortion simulation, and flight transient simulation.

Facility Benefits

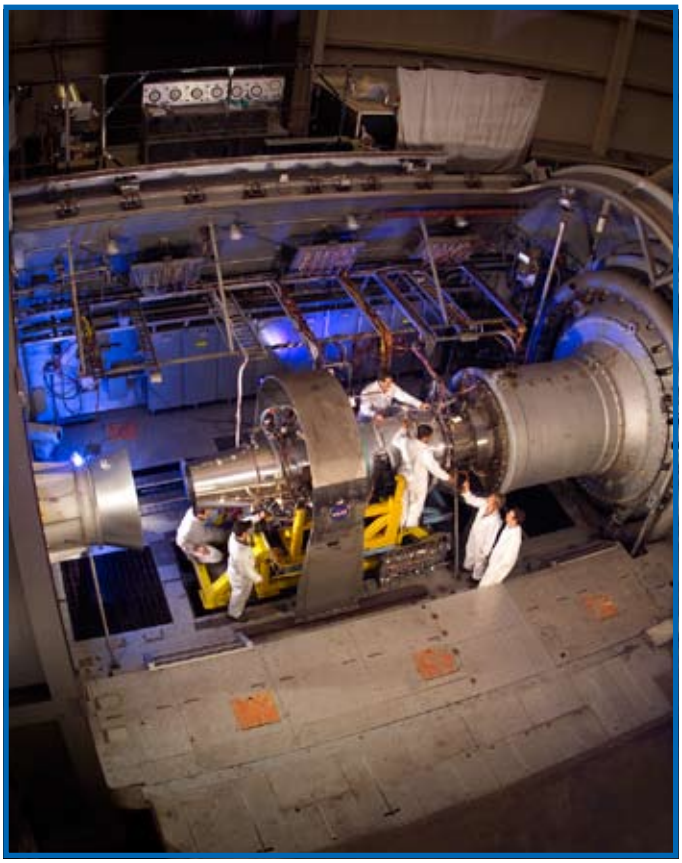
- Supports NASA's research and testing mission and charter
- Equipped with a new, high-speed digital system
- Direct connect or free-jet mode
- Infrastructure in place for secure testing
- Accommodates in-house and private industry research programs
- Experienced staff of technicians, engineers, researchers, and operators

Commercial Applications

- Jet engines
- Supersonic fighter models

Programs and Projects Supported

- Turbine-Based Combined Cycle Systems (TBCC)
- DoD/NASA Cooperative Research
- SR–71, F–5E/–5F, F–5A/B, C–9, F–15, F–16, EF–111A, A–10A, B52, F/A–18, F–22, ECLIPSE



Overhead view of PSL test chamber 4.

Capabilities

Propulsion Systems Laboratory (PSL)	
Test cell size	24 diam by 39 ft long
Simulated altitude	5,000 to 90,000 ft
Simulated flight speed	Mach number
PSL–3	to 3.0
PSL–4	to 4.0
PSL–4 (freejet with heater)	to 6.0
Maximum inlet mass flow	
PSL–3 and PSL–4 (at 55 psia)	480 lbm/s
PSL–4 (at 165 psia)	380 lbm/s
Inlet total temperature	
PSL–3	–60 to 600 °F
PSL–4	–90 to 1,100 °F
Maximum exhaust mass flow	750 lbm/s
Core testing capability	
180 psia	25 lbm/s at 1,375 °F
425 psia	10 lbm/s at 1,100 °F
425 psi	73 lbm/s at 450 °F
465 psi	39 lbm/s at 1,200 °F
Cooling air (mass flow) 100 lb/sec	55, 165, 450 (psia)
Thrust measurement	
Axial	50,000 lbf
Vertical	15,000 lbf
Lateral	15,000 lbf
Fuel systems	Jet A, JP–4, JP–5, or JP–8
	Hydrogen
Fuel flow rate (at 65 psia)	200 gpm

Facility Testing Information

http://facilities.grc.nasa.gov

Contacts

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Performance tests of a Pratt & Whitney 308 turbofan engine in PSL–4.

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